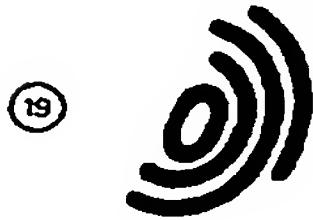


1021014

10.604. 228

10.27.2003



# Europäisches Patentamt

# European Patent Office

# Office européen des brevets



⑪ Publication number:

0 647 392 A1

12

# EUROPEAN PATENT APPLICATION

(21) Application number: 94202890.3

⑤1 Int. Cl. 6: A01J 7/00

**22 Date of filing: 05.10.94**

③ Priority: 11.10.93 NL 9301751

(43) Date of publication of application:  
**12.04.95 Bulletin 95/15**

**B4** Designated Contracting States:  
**DE FR GB NL SE**

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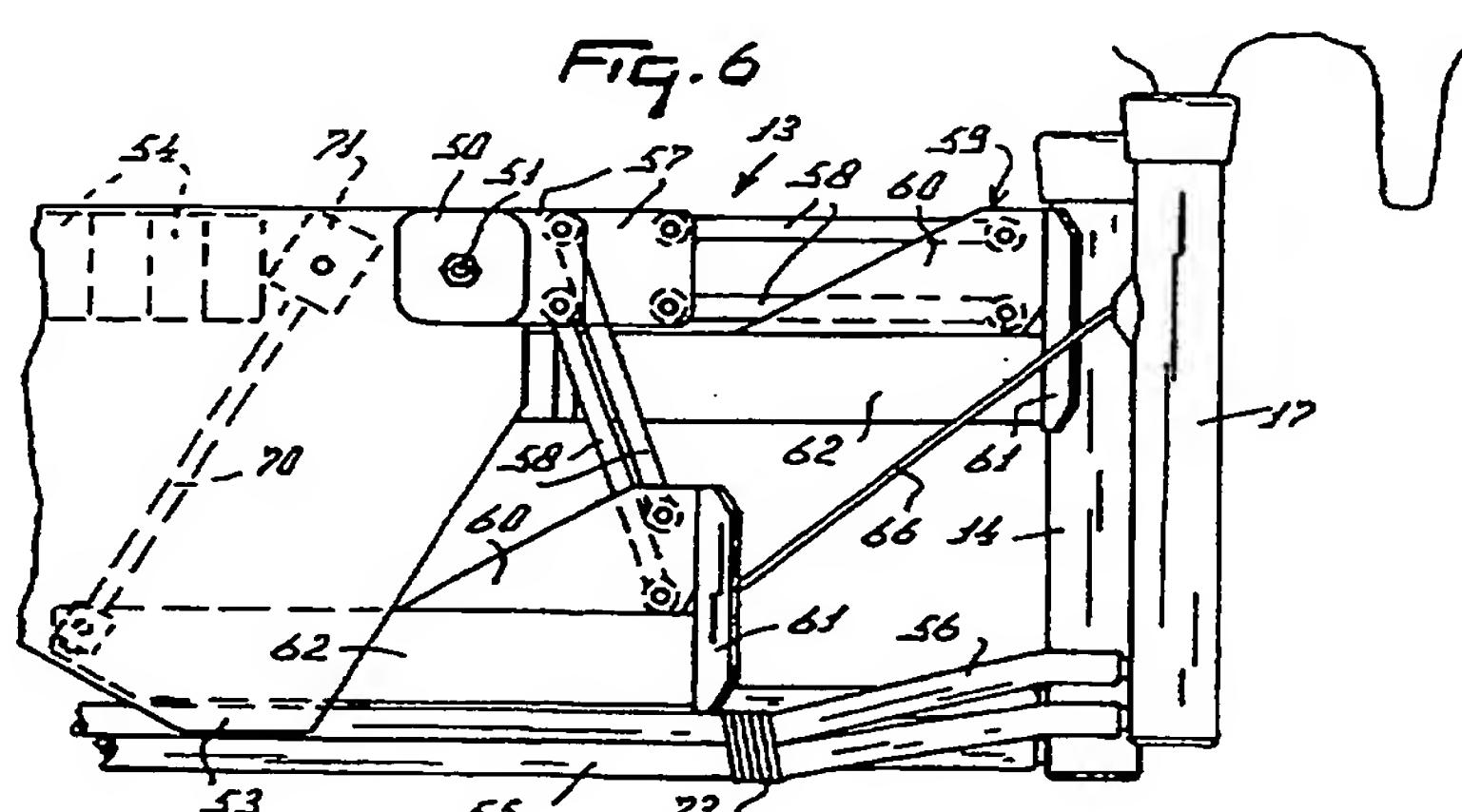
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## 54 A construction for automatically milking animals.

57) The invention relates to a construction for milking animals, such as cows, comprising a milking robot (8) for automatically connecting teat cups (14; 15; 16; 17) to the teats of an animal. When a teat cup (14; 15; 16; 17) gets disconnected, whilst the other teat cups (14; 15; 16; 17) are still in the connected state, then the disconnected teat cup can again be connected without being obstructed by an other teat cup (14; 15; 16; 17). For renewed connecting of the disconnected teat cup (14; 15; 16; 17), it is

not necessary to disconnect the other teat cups (14; 15; 16; 17). To render this possible, the head (13) of the milking robot (8) comprises holders (59) for teat cups (14; 15; 16; 17) which are capable of moving downwards. By moving the holder (59) downwards after the associated teat cup (14; 15; 16; 17) has been connected to a teat, this cup (14; 15; 16; 17) is no obstacle during connecting of the adjacent teat cup (14; 15; 16; 17).



The invention relates to a construction for milking animals, such as cows, comprising a milking robot for automatically connecting teat cups to the teats of an animal.

Constructions of this type are known.

In said constructions it may happen that during milking a teat cup gets disconnected from a teat. This may, for example, happen when a cow kicks at the teat cup. In order to enable the disconnected teat cup to be connected again, an other teat cups already being connected may have to be disconnected.

The invention has for its object to provide a construction of the above-described type, in which said disadvantage does not occur.

According to the invention this is achieved in that a teat cup, after it has been disconnected, can be connected again without being obstructed by an other teat cup. Consequently, the flow of milk from the animal during renewed connecting of the disconnected teat cup can continue. In accordance with the invention, the construction is further characterized in that a teat cup, after it has been disconnected from a relevant teat, can be connected again without it being necessary that one of the further teat cups is first disconnected. Thus, when the disconnected teat cup is connected again, a saving of time is achieved. In accordance with a still further feature of the invention, the head end of the milking robot has holders for teat cups, in which a holder can be moved downwards, whilst an other holder is arranged such that it can be moved upwards. The invention therefore also relates to a construction for milking animals, such as cows, comprising a milking robot for automatically connecting teat cups to the teats of an animal, characterized in that the head end of the milking robot has holders for teat cups, in which a holder can be moved downwards, whilst an other holder is arranged such that it can be moved upwards. By moving a holder down after an associated teat cups has been connected, the teat cup holder does not form an obstacle during connecting of the adjacent teat cup. In accordance with a further feature of the invention, each of the holders is arranged such that it can be moved down and towards the robot head independently of the further holders. In accordance with a further feature of the invention, the motion of a holder in the downward direction and towards the milking robot is so great that this holder remains outside the reach of associated teat cups which have already been connected to the teats, even if the head of the milking robot is moved to a position in which an other teat cup can be connected to a teat. In accordance with a still further feature of the invention, the teat cups are first connected to the rear teats and thereafter to the front teats, whilst, when thereafter one of the teat cups is discon-

nected from a rear teat, the adjacent holder of the teat cup connected to a front teat can be moved down so far and towards the milking robot that, when the relevant teat cup is again connected to the rear teat, this adjacent holder remains outside the reach of the relevant teat cup connected to a front teat.

According to the invention, the milking robot further includes four units, each comprising a holder including a teat cup and a portion of a milk and/or pulsation tube, as well as a lifting mechanism for this holder. To facilitate replacement of such a unit, the units can be removed, in accordance with the invention, individually and as an integral whole from the milking robot. Therefore, the invention further relates to a construction for milking animals, such as cows, comprising a milking robot for automatically connecting teat cups to teats of an animal, characterized in that the head of a milking robot comprises four units, each comprising a holder including a teat cup and a portion of a milk and/or pulsation tube, as well as a lifting mechanism for this holder, these units being removable from the milking robot individually and as an integral whole.

In accordance with a characterizing feature of the invention, the lifting mechanism is constituted by a four-bar linkage which is mainly operative and deformable in a predominantly vertical plane and forms a system of rods. In accordance with a still further feature of the invention, a unit includes a carrier element which can be rigidly mounted on the milking robot and on which a motor is disposed, the lifting mechanism being operative between the carrier element and the holder of a teat cup, whilst the holder is movable from a condition of rest both downwards towards the milking robot and upwards by means of a motor-driven transmission element. In accordance with a feature of the invention, the motor is a stepping motor and the transmission element is formed by a threaded spindle which is drivable by this motor and co-operates with a nut attached to the holder. In accordance with a further feature of the invention, the units are arranged such that they are slidable by means of a carrier element over a carrier beam which is rigidly attached to the milking robot.

In order to increase the accessibility of the front teats, at least two units, to whose end a teat cup is attached, are pivotal about a substantially vertical shaft. The invention, therefore, also relates to a construction for milking animals, such as cows, comprising a milking robot for automatically connecting teat cups to the teats of an animal, characterized in that the head of the milking robot comprises four units, each of which includes a teat cup, as well as a lifting mechanism for this teat cup, and whilst at least two units are pivotal about

a substantially vertical shaft. In accordance with a still further feature of the invention, the pivotal portion of the unit can be pivoted with the aid of a stepping motor. In accordance with an other feature of the invention, the holder for a teat cup includes a tubular portion, and the milking robot is provided with a retracting device, accommodated in a tubular portion of the holder, for the relevant teat cup. The invention, therefore, further relates to a construction for milking animals, such as cows, comprising a milking robot for automatically connecting teat cups to the teats of an animal, characterized in that the milking robot is provided with a retracting device for this teat cup, accommodated in a tubular portion of a holder for a teat cup. Since the retracting device is accommodated in a tubular portion, it is adequately protected and relatively compact. In accordance with a still further feature of the invention, the retracting device includes a flexible connection member, via which a teat cup is connected to a holder, whilst the tubular portion of the holder includes an operating cylinder for pulling the relevant disconnected teat cup against the holder.

In accordance with a further feature of the invention, the carrier element includes a connecting block for a milk and/or pulsation tube which extends from the relevant teat cup. In accordance with a still further feature of the invention, the milk and/or pulsation tube portion extends in the shape of a loop between the teat cup and a connecting block.

In accordance with the invention, the construction is further characterized, in that the portion of the milk and/or pulsation tube between the teat cup and a connecting block passes underneath the head or through the lower portion of the head of the milking robot to beyond that end of the head that is remote from the teat cups and thereafter is looped-back in a predominantly vertical plane to the connecting block. To prevent the milk and/or pulsation tubes from sagging, the milk and/or pulsation tubes are wrapped together, in accordance with a further feature of the invention, near a connection to the teat cup in a side-by-side relationship.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 is a side view of a milking cluster incorporating a milking robot, in which the circumference of a milk animal, in the present case a cow, is shown;

Figure 2 is a plan view in accordance with Figure 1, in which a detection member for determining the position of the teats is arranged next to the milking parlour;

5 Figure 3 shows the front portion of the robot arm of Figure 1, in which the teat cups are arrayed in a central position;

10 Figure 4 is a plan view of the milking robot head as shown in Figure 3;

15 Figure 5 illustrates the teat cups in the lifted state;

20 Figure 6 shows the position of the milking robot head when a front teat cup must be connected again, whilst the rear teat cups are already in the connected state;

25 Figure 7 is a plan view of the teat cups, in which at the left-hand side of the lay-out of the drawing the arrangement for connecting the teat cups to the teats is shown, whilst at the right-hand side of the drawing the teat cups are shown after they have already been connected to the teats, broken lines indicating the position of the outermost teat cup holders during renewed connection of an inadvertently disconnected front teat cup, and

30 Figure 8 shows an alternative embodiment of the robot head, in which a holder for a teat cup near this teat cup is provided with a vertical pivot shaft, about which the relevant teat cup can be rotated.

35 Corresponding components in the drawings have been given the same reference numerals. The invention is in no way limited to the embodiments shown and described here; they only serve by way of illustration of the inventive idea.

40 Figure 1 is a side view of a milking box 1, in which the contours of a cow are shown. The milking box 1 includes a railing 2 and is provided at one side with an entrance door 3 and an exit door 4 (Figure 2). At the facing side of the entrance and exit doors, the railing 2 of the milking box 1 is fitted with a longitudinal straight guide 5, which has one end connected to a girder 6 of the milking box 1 and its other end to the side wall of the railing 2. A slidable sleeve 7, which can be moved by a motor (not shown), is accommodated on the straight guide 5. Attached to the sleeve 7 is a milking robot 8 which by shifting of the sleeve 7 moves the milking robot 8 in the longitudinal direction of the milking box 1. A vertical shaft 9, about which a horizontal beam 10 of the milking robot 8 is rotatably attached, is secured to the bottom side of the sleeve 7. A second beam 12 is arranged parallel to the beam 10, at some distance therefrom by means of a four-bar linkage 11. Using a cylinder (not shown), the second beam 12 can be moved relative to the first beam 10 in a horizontal plane, so that a robot head 13, which comprises teat cups 14 to 17 and is attached to the end of the beam 12, can be moved transversely in the milking box. At its upper side, the milking robot head 13 is provided with a cover plate 18 which is slidable to-

wards the teat cups and which, when the teat cups 14 to 17 are not connected to the teats, covers the apertures of the teat cups. At that side of the milking box 1 where the longitudinal straight guide 5 for the milking robot 8 is arranged, a movable detector 19 is disposed, which preferably is constituted by a laser. The position of the teats of an animal to be milked standing in the milking box 1 can be determined with the aid of the detector 19. The detector 19 is connected to a second longitudinal straight guide 20, which renders it possible to slide the detector 19 in the longitudinal direction of the box. The second longitudinal straight guide 20 comprises two spaced-apart rods 21, which are arranged one below the other next to the milking box 1 and have one end connected to the railing 2 of the milking box 1 via two girders 22. A second sleeve 23 is disposed in such a manner around the two longitudinal straight guides 20 that it is slidable in the longitudinal direction of the milking box 1. The second sleeve 23 can be moved along the two longitudinal straight guides 20 by means of a threaded spindle, which is inserted between the two longitudinal straight guides 20 and through the sleeve 23 and is driven by a stepping motor 25. Extending in the longitudinal direction of the milking box 1, the second sleeve 23 is provided with an arm 26 which at its end is provided with a second four-bar linkage 27, to which, extending transversely of the longitudinal direction of the milking box 1, a U-shaped holder 28 is attached. The detector 19 is clamped pivotally about a vertical shaft 29, between the U-shaped holder 28. The detector 19 can be pivoted about the vertical shaft 29 by means of a stepping motor 30 disposed on top of the U-shaped holder 28. The detector 29 is comprised of a vertically arranged cylindrical housing, on top of which a truncated cone-shaped jacket 31 is placed at a square angle. In the present embodiment, the cylindrical housing 19 accommodates a laser, which transmits a signal via a window in this housing and through the truncated cone-shaped jacket 31. It will be obvious that the detector may alternatively be formed by e.g. an ultrasonic sensor. The truncated cone-shaped jacket 31 shields the window in the detector 19, so that the laser and/or e.g. the ultrasonic sensor will not so easily be put out of order by contamination. In addition to the fact that the detector 19 can be moved in the longitudinal direction of the milking box 1, it is also possible for the detector to be moved in height by means of a stepping motor (not shown), using the second four-bar linkage 27.

Near the leading side of the milking box 1 there is further arranged a feeding trough 32, which has at its upper side a flexible tube 33 which is connected to an automatic concentrate dosing device (not shown), for automatically discharging con-

centrate into the feeding trough 32. At the bottom side, the feeding trough 32 is connected to a vertically arranged third four-bar linkage 34, which has its other end connected to a beam 35 connected horizontally to the railing 2. Using a cylinder (not shown) which is connected to an arm of the third four-bar linkage 34, the feeding trough can be swivelled from the milking box 1 to thereoutside, so that the cow can no longer eat from the feeding trough 32.

The milking box 1 further incorporates, arranged near its trailing end, a dung collecting member 36. The dung collecting member 36 includes a container 37 which has a bottom 38 which extends obliquely downwardly from the cow. The bottom 38 encloses an angle of preferably approximately 20° with the horizontal. Connected to the lowest part of the bottom 38 there is a flexible discharge pipe 39 which leads to a dung cellar (not shown) under the milking box 1. At its bottom side, the container 37 is connected to a vertically arranged fourth four-bar linkage 40, which has its other side connected to the floor 41 of the milking box 1. By means of a cylinder (not shown) connected to the fourth four-bar linkage 40, it is possible to swing the container 37 aside to outside the milking box 1, so that, when a cow enters the milking box 1 via the entrance door 3, it will not be obstructed by the container 37. It will be obvious that, when the cow has taken up her position in the milking box 1, the container 37 will again be swivelled towards the cow, so that, when the cow drops dung, it will be collected in the container 37 and directly discharged into the dung cellar via the flexible discharge pipe 39. Since the bottom 38 is arranged at an oblique angle, the dropping rate of the dung will be low and thus the dung will be prevented from splashing on hitting the bottom 38.

To make the stay of the cow in the milking box 1 a pleasant stay, the floor 41 is provided in the region of the cows legs, with slats 42 which together form a continuous floor. Between and next to the slats 42, the floor 41 is further designed as a grid floor 43. The dung cellar (not shown) is located under the grid floor 43, so that dirt drops into the dung cellar via the grid 43.

Figures 3 to 8 are further illustrations of the construction of the robot head 13. Figure 4 shows a portion of the second beam 12 of the milking robot 8, and it is shown that the second beam 12 is provided at its end with a plate 44, by means of which the robot head 13 is secured to the second beam 12. A stay rod 45 is arranged between the plate 44 and the second beam 12. The robot head 13 also includes a mounting plate 46 which corresponds to the plate 44 and is detachably bolted to the plate 44 by means of bolts 47. In a position perpendicular to the mounting plate 46 there is a

box-like supporting beam 48, around which four units 49 are pushed which are locked by means of an end plate 50 with a bolt 51. The structure of each of the units 49 will now be described in greater detail with reference to Figure 3.

Each unit 49 includes a box-like carrier beam 52, which can be pushed over the supporting beam 48. The carrier beam 52 is provided with two spaced-apart plates 53, between which a connecting block 54 for a milk and pulsation tube 55, 56 is secured. At the leading side of the carrier beam 52, two spaced-apart lugs 57 are disposed, to which a rod system 58 forming a deformable quadrangle is connected. The rod system 58, which forms a deformable quadrangle, has its other end connected to a holder 59 for a teat cup (14; 15; 16; 17). Each of the holders 59 is assembled from two spaced-apart plates 60 which at their ends are interconnected so as to form a curved seat 61, against which a teat cup can bear. By means of their lower sides, the plates 60 are secured on a tubular holder 62, in which a cylinder 43 is accommodated. At the end of the piston rod 64 of the cylinder 63, a roller element 65 is disposed, around which a flexible cord 66 is passed. The cord 66 has one end connected to the tubular holder 62 and the other end to the teat cup. When a teat cup has been connected to a teat, the cylinder 63 is enabled and it is thus possible to pull the cord 66 from the tubular holder 62. When a teat cup is to be disconnected from a teat, the cylinder 63 is energized, as a result of which the cord 66 is retracted into the tubular holder 62, whereafter the teat cup is pulled up against the seat 61. At the other end of the tubular holder 62, two spaced-apart lugs 67 are attached, between which, pivotal about a horizontal shaft 68, a nut 69 is clamped. Inserted through the nut 69 is a threaded end 70, which has one end connected to a stepping motor 71. The stepping motor 71 is clamped between the plates 53 and is rotatable about a horizontal shaft 72. Using the transmission-element 70 which is controlled by the motor 71, it is possible to operate the lifting structure 58, 59, 60, 62, 70, 71, and thus to move the teat cups and also the holder 59 upwardly. Furthermore, each of the units 49 can be replaced individually when getting out of order.

Near the teat cups, the milk tube 55 and the pulsation tube 56 are wrapped together by a wrapping 73. The wrapping 73 may be in the form of a length of tape, an iron wire, a bandage, etc. Because of the wrapping 73, the first portion 74 of the milk and pulsation tubes 55, 56, which extend from the teat cup to just behind the plates 53, is relatively rigid and consequently oriented more or less in a horizontal plane. The second portion 75 of the milk and pulsation tubes 55, 56 extends in the shape of a loop and is located in a vertical plane.

The second portion 75 of the milk and pulsation tubes 55, 56 is relatively flexible. During the upward motion of the teat cups, the first portion 74 will therefore bend to a minimum extent, whilst the second portion 75 bends relatively much. Since the first portion 74 is relatively rigid, the milk and pulsation tubes 55, 56 will be prevented from sagging and landing on the floor 41 of the milking box 1. An additional advantage is that, consequently, the head 13 of the milking robot can be moved at a relatively low level along the floor 41, without portions of the milking robot 8 coming into contact with the floor 41 of the milking box 1.

In the second embodiment as shown in Figure 8, the teat cups are pivotal about an upwardly directed shaft with the aid of a pivotal structure 76. The pivotal structure 76 includes a tube 77 attached to the ends of the plates 60. A pivotal shaft 78 is passed through the tube 77, which tube is connected at its bottom side to a stepping motor 79, which itself is rigidly connected to the tubular holder 62 via a support 80. The seat 61 of the teat cup is rigidly connected by means of lugs 81 to the pivotal shaft 78. By energizing the stepping motor 79, it is possible to rotate the seat 61 with the teat cup around the shaft 78. In this manner also teats which are very remote from each other, which e.g. in a plan view are arranged more or less in a square, can easily be reached by the teat cups 14 to 17 without the teat cups forming an obstruction to each other.

The mode of operation of the present construction for automatically milking animals will now be described in greater detail.

When a cow has entered the milking box 1 via the entrance door 3, this is recorded on the basis of the cow identification collar 82 around the neck of the cow and concentrate is discharged in the feeding trough 32 via the concentrate dosing implement. Thereafter the dung collecting member 36 is pivoted to near the rear side of the cow. In consequence thereof the detector 19 is moved in the longitudinal direction of the milking box 1, so that the teats of the cow arrive within the measuring range (taken in the vertical plane) of the detector. By means of the second four-bar linkage 27, the height at which the detector beam of the detector 19 is now located is adjusted such that, also in the horizontal plane, the teats come within the measuring range of the detector 19. Thereafter the stepping motor 30 is energized, so that the detector is pivoted about the vertical shaft 29. The detector 19 is preferably pivoted through an angle of approximately 25°. After the position of the four teats has been determined with the aid of the detector 19, the robot head 13 is pivoted to under the cow and, using the four-bar linkage 11, the robot head 13 is positioned in the lateral direction of the milking box 1.

1. Thereafter the teat cups 14 to 17, by energizing the stepping motor 71, are moved to the central position as shown in Figure 3. Thereafter the robot head is moved in the longitudinal direction of the milking box 1 along the longitudinal straight guide 5, and the teat cup 14 is positioned under the left-hand rear teat. The stepping motor 71 of the teat cup 14 is then energized again, whereafter the teat cup 14 is lifted upwardly, as shown in Figure 5. After the teat cup has been evacuated via the milk tube 55, this cup is connected by this vacuum to the left-hand rear teat and thereafter the cylinder 63 of the teat cup 14 is disabled, so that the teat cup can get loose from the seat 61. Thereafter the teat cups 15, 16 and 17 are connected in the same manner one after the other to the further teats of the cow. In the right-hand half of Figure 7 it is illustrated how the teat cups 14 to 17 are arranged during milking. If now the teat cup 14 is inadvertently kicked from the teat or gets disconnected therefrom in any other way, the teat cup is immediately pulled up against the seat 61 of the relevant holder 59. So as to be able to connect the cup 14 again without the need for the cup 17 to be removed, the holder 59 of the teat cup 17 is thereafter pivoted downwards by means of the stepping motor 71 to the position shown in Figure 6. The holder 59 of the teat cup 17 is then in the position shown in Figure 7 by broken lines. Thereafter the holder 59 of the teat cup 14 is again moved towards the left-hand rear teat, all this in such a manner that the teat cup 14 arrives in a position such that its aperture is in a position under the left-hand rear teat. Thereafter the stepping motor 71 is energized again and the teat cup 14 is moved up and is connected to the teat. The robot head 13 can then again be moved away from the teat, so that the initial situation, such as it is shown at the right-hand half of Figure 7, is obtained. The teat cup 14 is then again in the connected state, without the need for disconnecting the further teat cups. It will be obvious that this procedure results in a considerable gain in time, and that the milking procedure of the other quarters need not be interrupted when the disconnected cup is to be connected to the teat again.

#### Claims

1. A construction for automatically milking animals, such as cows, comprising a milking robot (8) for automatically connecting teat cups (14, 15, 16, 17) to the teats of an animal, characterized in that a teat cup (14; 15; 16; 17), after it has been disconnected, can be connected again without being obstructed by another teat cup (14; 15; 16; 17).  
5
2. A construction as claimed in claim 1, characterized in that a teat cup (14; 15; 16; 17), after it has been disconnected, can be connected again without it being necessary for one of the other teat cups (14; 15; 16; 17) to be disconnected.  
10
3. A construction as claimed in claim 1 or 2, characterized in that the head (13) of the milking robot (8) includes holders (59) for teat cups (14; 15; 16; 17), a holder (59) being capable of moving down, whilst an other holder (59) is disposed such that it is capable of moving upwards.  
15
4. A construction for milking animals, such as cows, comprising a milking robot (8) for automatically connecting teat cups (14, 15, 16, 17) to the teats of an animal, characterized in that the head (13) of the milking robot (8) includes holders (59) for teat cups (14, 15, 16, 17), a holder (59) being capable of moving down, whilst an other holder (59) is disposed such that it is capable of moving up.  
20
5. A construction as claimed in claim 3 or 4, characterized in that each of the holders (59) is disposed such that it is capable of moving down and towards the robot head (13) independently of the other holders (59).  
25
6. A construction as claimed in any one of claims 3 to 5, characterized in that the downward motion of a holder (59) and the motion towards the milking robot (8) is of such a length that this holder (59) remains outside the reach of the associated teat cup (14; 15; 16; 17) already connected to a teat, even when the head (13) of the milking robot (8) is adjusted to a position in which a further teat cup (14; 15; 16; 17) can be connected to a teat.  
30
7. A construction as claimed in claim 6, characterized in that the teat cups (14, 15, 16, 17) are connected first to the rear teats and thereafter to the front teats, whilst, when thereafter one of the teat cups (14, 15, 16, 17) is disconnected from a rear teat, the adjacent holder (57) of the teat cup (14; 15; 16; 17) connected to a front teat can be moved down and towards the milking robot (8) in such a manner that, when the relevant teat cup (14; 15; 16; 17) is again connected to the rear teat, this adjacent holder (57) remains outside the reach of the relevant teat cup (14; 15; 16; 17) connected to a front teat.  
35
8. A construction as claimed in claim 6, characterized in that the teat cups (14, 15, 16, 17) are connected first to the front teats and thereafter to the rear teats, whilst, when thereafter one of the teat cups (14, 15, 16, 17) is disconnected from a front teat, the adjacent holder (57) of the teat cup (14; 15; 16; 17) connected to a rear teat can be moved down and towards the milking robot (8) in such a manner that, when the relevant teat cup (14; 15; 16; 17) is again connected to the front teat, this adjacent holder (57) remains outside the reach of the relevant teat cup (14; 15; 16; 17) connected to a rear teat.  
40
9. A construction as claimed in claim 6, characterized in that the teat cups (14, 15, 16, 17) are connected first to the rear teats and thereafter to the front teats, whilst, when thereafter one of the teat cups (14, 15, 16, 17) is disconnected from a rear teat, the adjacent holder (57) of the teat cup (14; 15; 16; 17) connected to a front teat can be moved down and towards the milking robot (8) in such a manner that, when the relevant teat cup (14; 15; 16; 17) is again connected to the rear teat, this adjacent holder (57) remains outside the reach of the relevant teat cup (14; 15; 16; 17) connected to a front teat.  
45
10. A construction as claimed in claim 6, characterized in that the teat cups (14, 15, 16, 17) are connected first to the front teats and thereafter to the rear teats, whilst, when thereafter one of the teat cups (14, 15, 16, 17) is disconnected from a front teat, the adjacent holder (57) of the teat cup (14; 15; 16; 17) connected to a rear teat can be moved down and towards the milking robot (8) in such a manner that, when the relevant teat cup (14; 15; 16; 17) is again connected to the front teat, this adjacent holder (57) remains outside the reach of the relevant teat cup (14; 15; 16; 17) connected to a rear teat.  
50
11. A construction as claimed in claim 6, characterized in that the teat cups (14, 15, 16, 17) are connected first to the rear teats and thereafter to the front teats, whilst, when thereafter one of the teat cups (14, 15, 16, 17) is disconnected from a rear teat, the adjacent holder (57) of the teat cup (14; 15; 16; 17) connected to a front teat can be moved down and towards the milking robot (8) in such a manner that, when the relevant teat cup (14; 15; 16; 17) is again connected to the rear teat, this adjacent holder (57) remains outside the reach of the relevant teat cup (14; 15; 16; 17) connected to a front teat.  
55

8. A construction as claimed in any one of claims 3 to 7, characterized in that the head (13) of the milking robot (8) comprises four units (49), each of which includes a holder (57) with a teat cup (14; 15; 16; 17) and a portion of a milk and/or pulsation tube (55; 56), as well as a lifting mechanism for this holder (57).

9. A construction as claimed in claim 8, characterized in that the units (49) can be removed individually and as an integral whole from the milking robot (8).

10. A construction as claimed in claim 8 or 9, characterized in that the lifting mechanism is constituted by a system of rods (58) which is operative in a predominantly vertical plane and forms a deformable quadrangle.

11. A construction as claimed in any one of claims 8 to 10, characterized in that a unit (49) includes a carrier element (48) which can rigidly be secured on the milking robot (8) and on which a motor (71) is disposed, the lifting mechanism acting between the carrier element (48) and the holder (57) for a teat cup (14; 15; 16; 17), whilst using a motor-driven transmission element (70), the holder (57) is movable from a resting position both downwards towards the milking robot (8) and upwards.

12. A construction as claimed in claim 11, characterized in that the motor (71) is a stepping motor and the transmission element (70) is formed by a threaded spindle which is drivable by this motor (71) and co-operates with a nut (69) attached to the holder (57).

13. A construction as claimed in claim 11 or 12, characterized in that a carrier element (49) is disposed such that it is slidable over a carrier beam (48) which is rigidly attached to the milking robot (8).

14. A construction as claimed in any one of the preceding claims, characterized in that at least two units (49), to whose end a teat cup (14; 15; 16; 17) is attached, are pivotal about a substantially vertical shaft (78).

15. A construction for milking animals, such as cows, comprising a milking robot (8) for automatically connecting teat cups (14; 15; 16; 17) to the teats of an animal, characterized in that the head (13) of the milking robot (8) comprises four units (49), each of which includes a teat cup (14; 15; 16; 17), as well as a lifting mechanism for this teat cup (14; 15; 16; 17), and whilst at least two units (49) are pivotal about a substantially vertical shaft (78).

5 16. A construction as claimed in claim 14 or 15, characterized in that the pivotal portion of the unit is pivoted by means of a stepping motor (79).

10 17. A construction as claimed in any one of claims 11 to 16, characterized in that a holder (59) for a teat cup (14; 15; 16; 17) includes a tubular portion and the milking robot is provided with a retracting device for the relevant teat cup (14; 15; 16; 17), which device is accommodated in the tubular portion (62) of the holder (59).

15 18. A construction as claimed in claim 17, characterized in that a retracting device includes a flexible connection member (66), via which a teat cup (14; 15; 16; 17) is connected to a holder (59), whilst the tubular portion (62) of the holder (59) includes an operating cylinder (63) for pulling the relevant disconnected teat cup (14; 15; 16; 17) against the holder (59).

20 19. A construction as claimed in any one of claims 11 to 18, characterized in that the carrier element (48) includes a connecting block (54) for a milk and/or pulsation tube (55; 56) extending from the relevant teat cup (14; 15; 16; 17).

25 20. A construction as claimed in claim 19, characterized in that the portion (75) of the milk and/or pulsation tube (55; 56) between a teat cup (14; 15; 16; 17) and a connecting block (54) extends in the shape of a loop.

30 21. A construction as claimed in claim 20, characterized in that the portion (75) of the milk and/or pulsation tube (55; 56) between a teat cup (14; 15; 16; 17) and a connecting block (54) passes underneath the head (13) or through the lower portion of the head (13) of the milking robot (8) to beyond that end of the head (13) that is remote from the teat cups (14; 15; 16; 17) and from there back to the connecting block (54) in a loop which extends predominantly in a vertical plane.

35 22. A construction as claimed in any one of claims 19 to 21, characterized in that a further portion of a milk and/or pulsation tube (55; 56) is laterally connected to a connecting block (54).

40 23. A construction as claimed in any one of claims 19 to 22, characterized in that for each teat cup (14, 15, 16, 17) there is a milk and/or pulsation tube (55; 56), which are wrapped

together in a side-by-side relationship near their connection to the teat cup (14; 15; 16; 17).

24. A construction as claimed in one or more of the preceding claims and/or as disclosed in the accompanying description with reference to the accompanying drawings. 5

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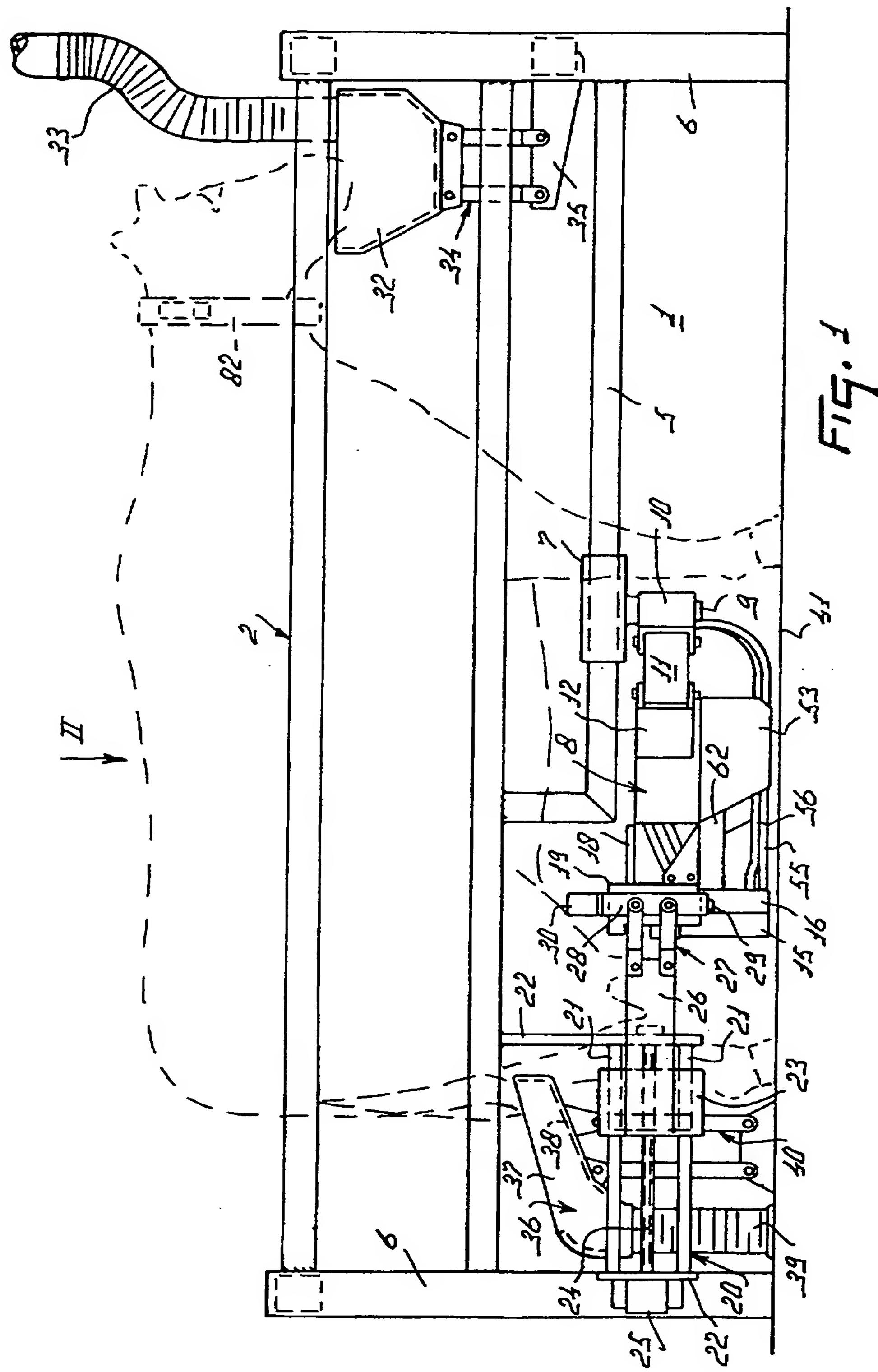
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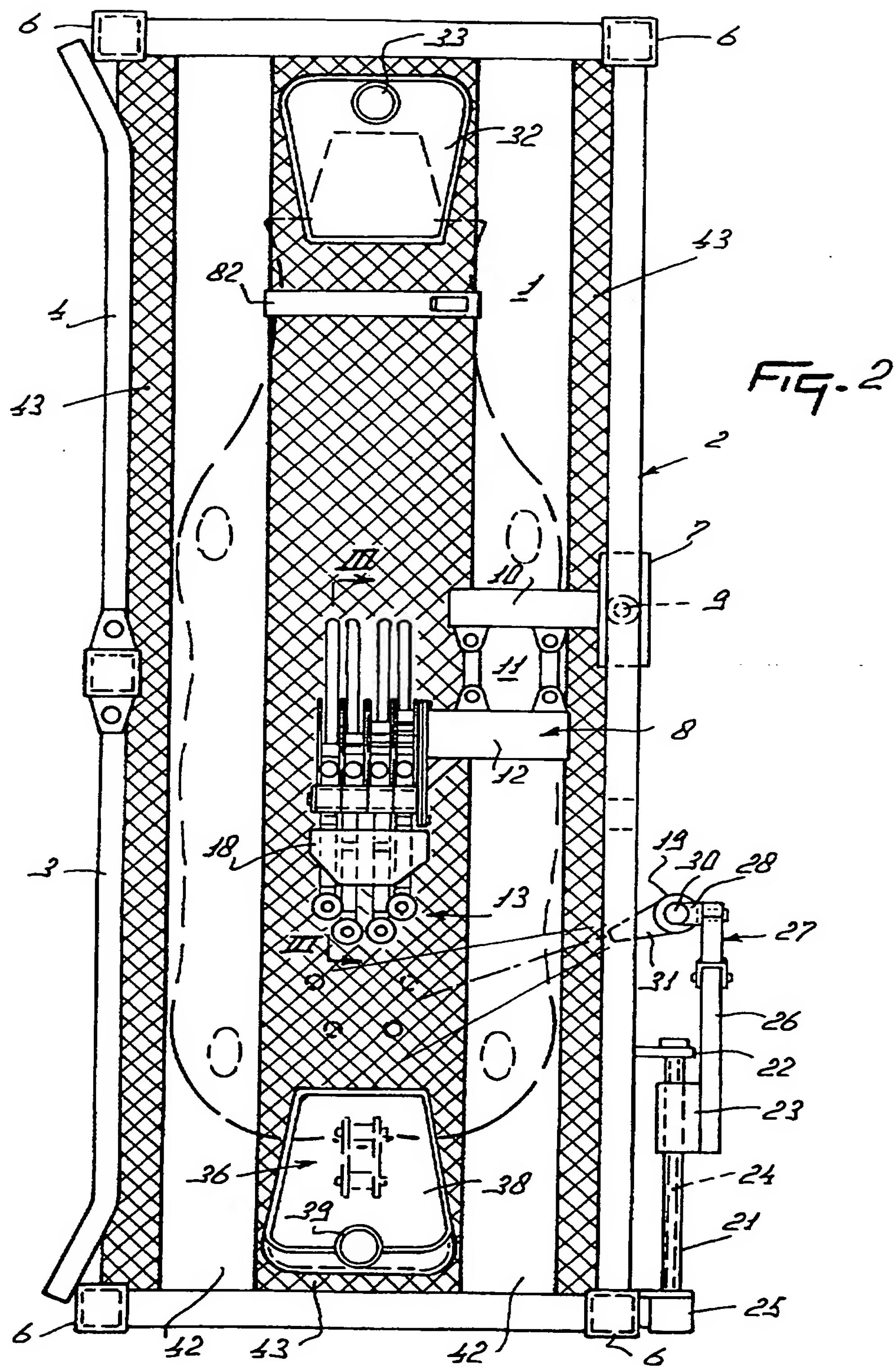
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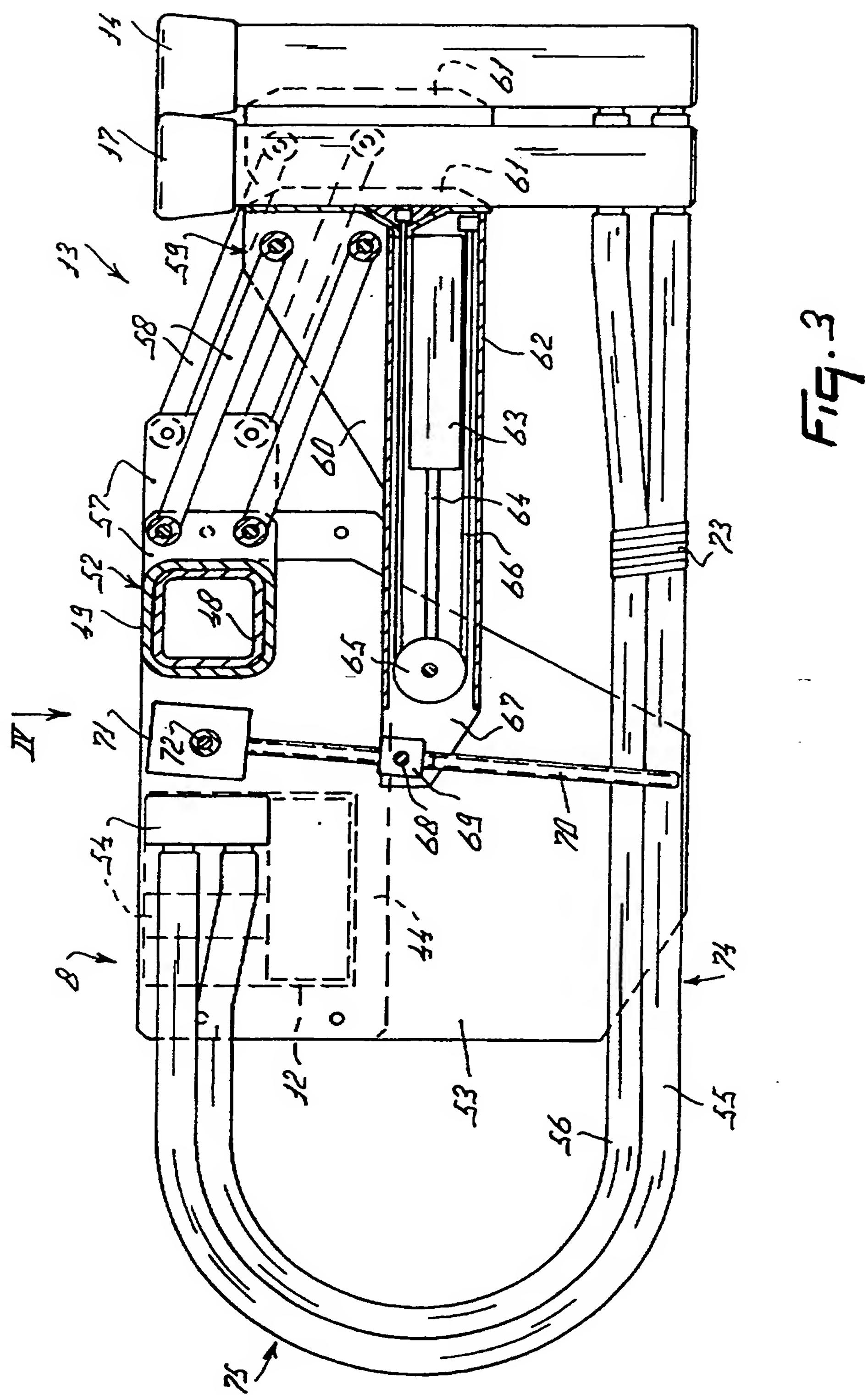
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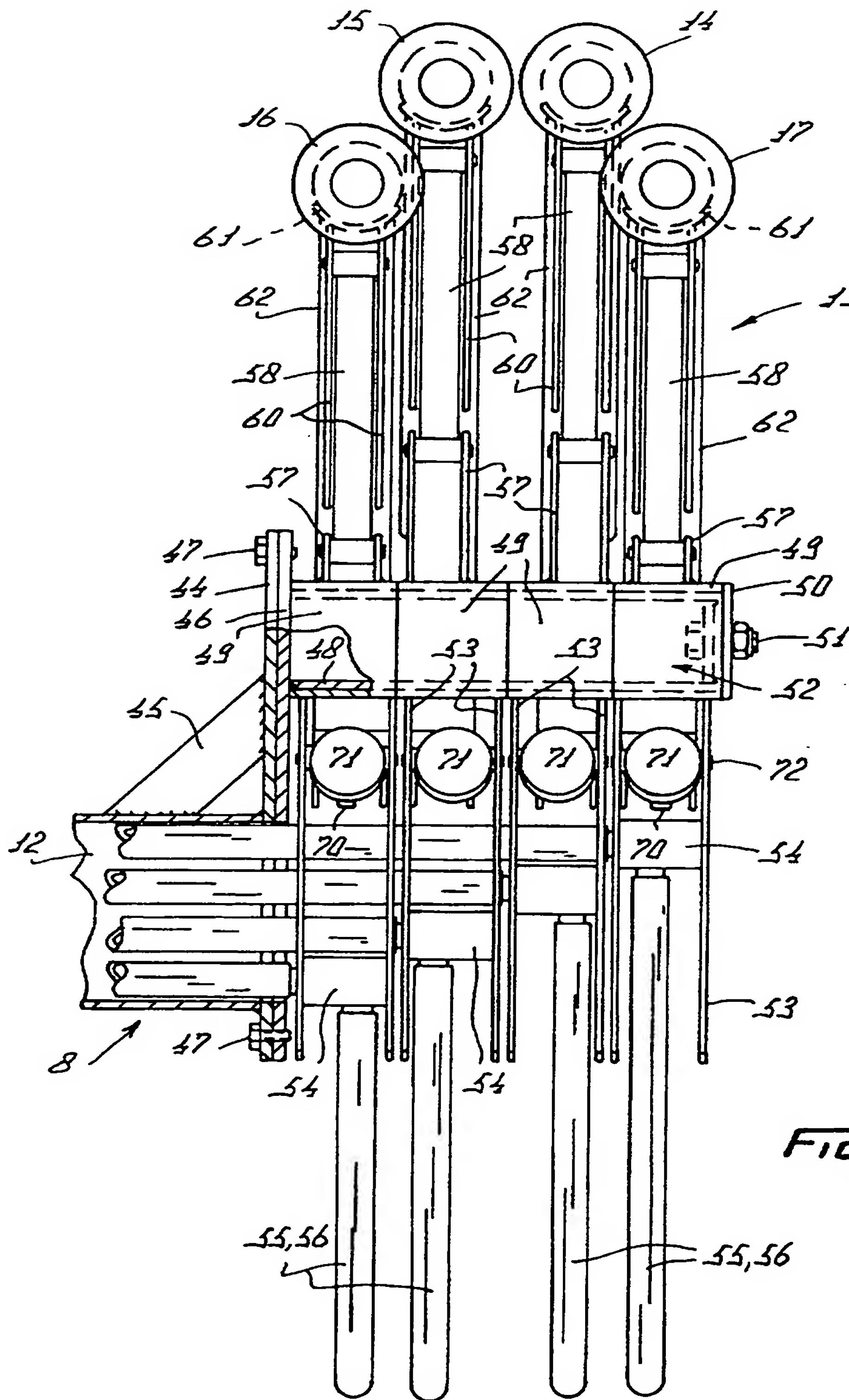
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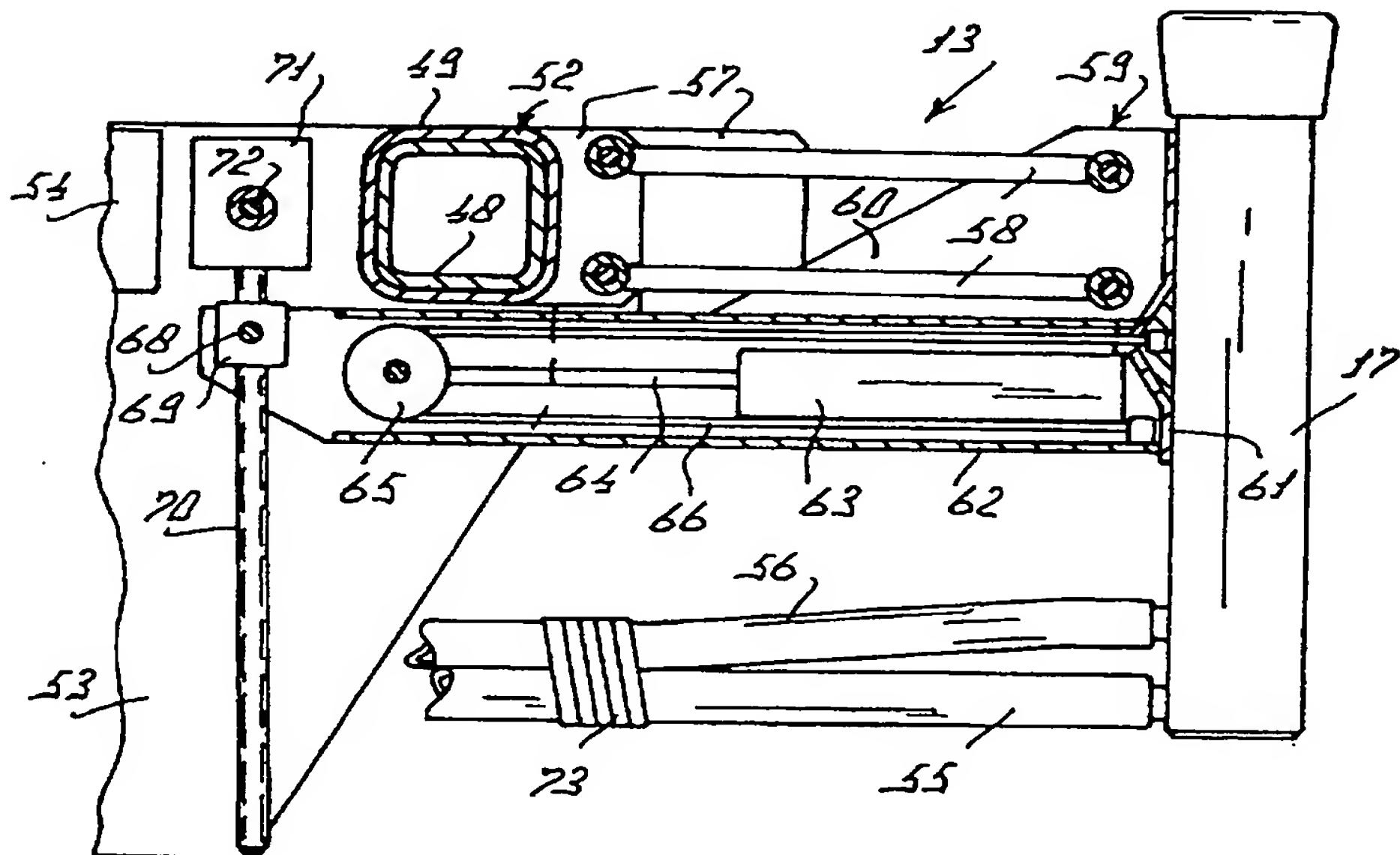
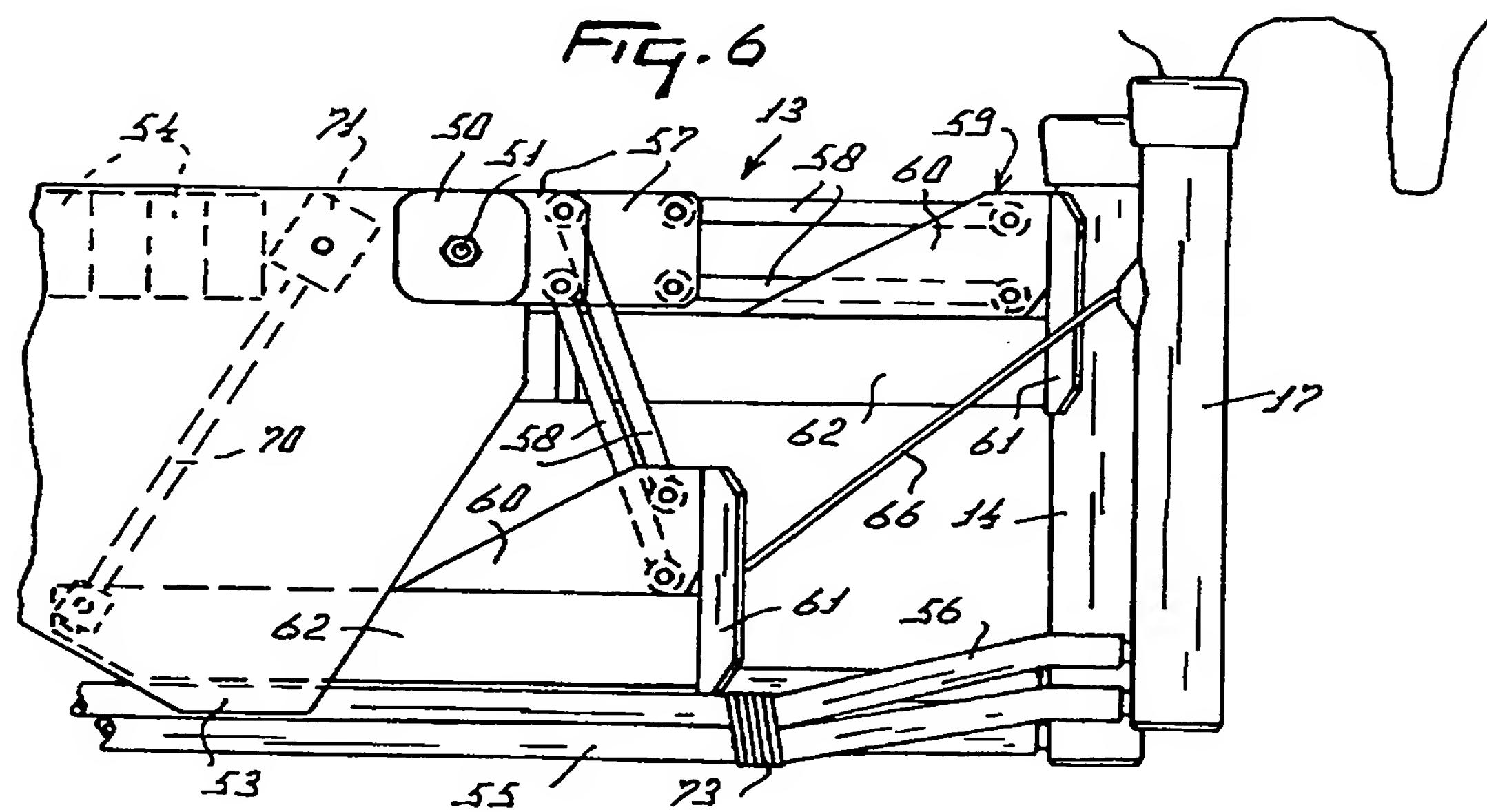
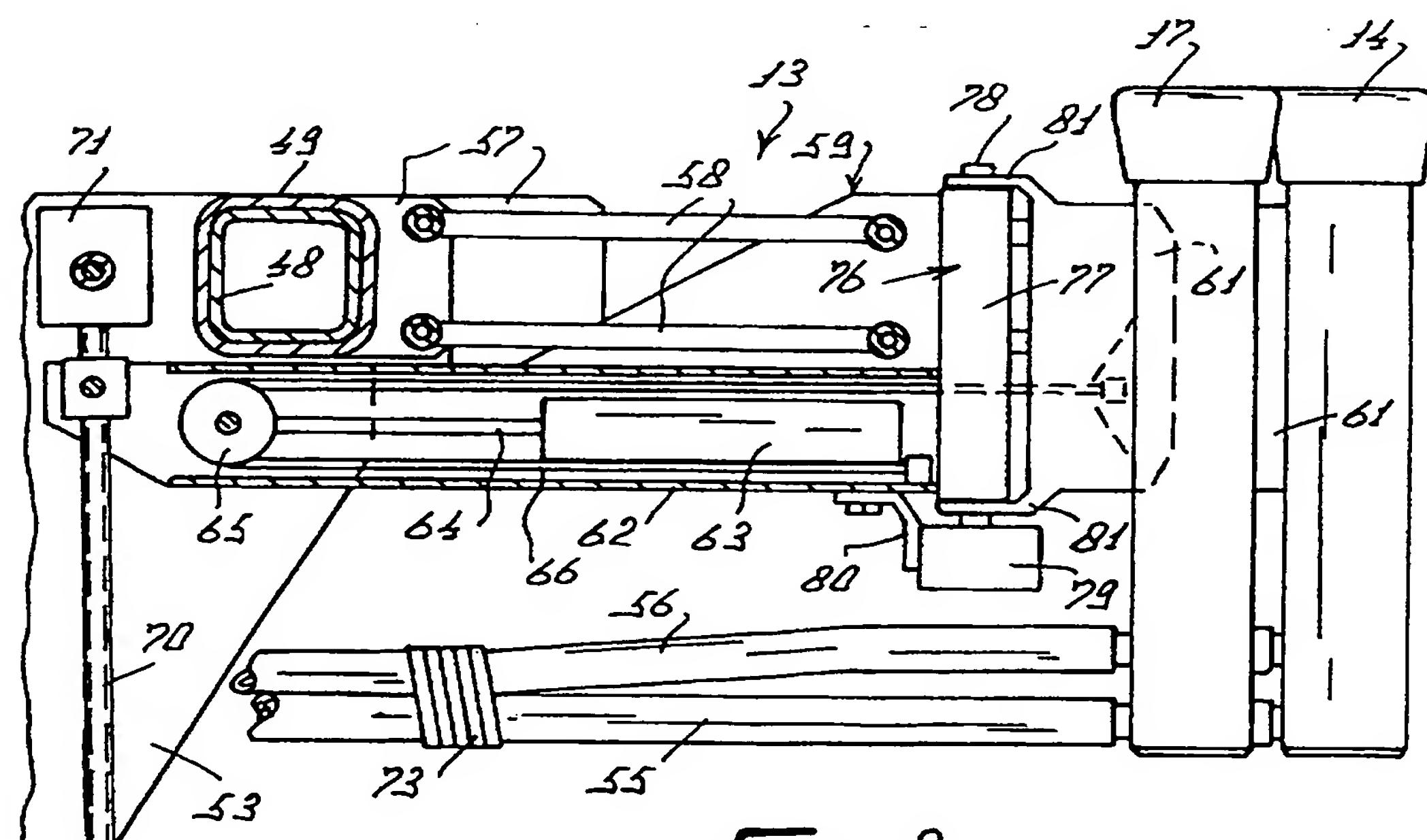
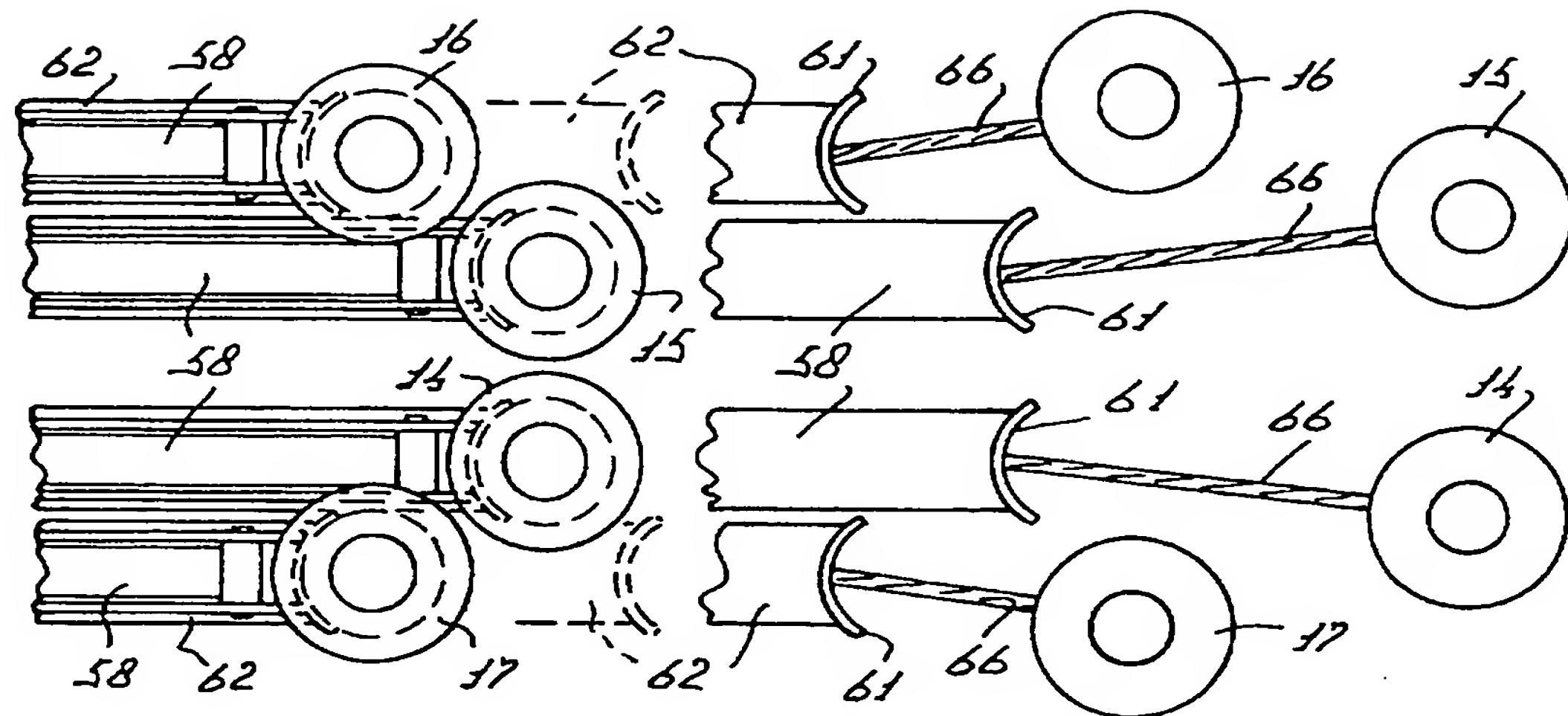


FIG. 5







European Patent  
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## EUROPEAN SEARCH REPORT

Application Number  
EP 94 20 2890

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP-A-0 532 066 (GASCOIGNE-MELOTTE) * column 1, line 21 - line 43 *	1-6	A01J7/00
A	* column 3, line 42 - column 5, line 2 * * claims; figures *	8,9,15, 28	
A	EP-A-0 472 247 (VAN DER LELY) * column 11, line 38 - column 12, line 44 *	1,5,28	
A	* claims 1,5; figures *	---	
A	EP-A-0 306 579 (CEMAGREF) * column 6, line 58 - column 7, line 32 * * column 9, line 26 - column 11, line 8 * * claim 1; figures 1,4-8 *	1,5,28	
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			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A01J
The present search report has been drawn up for all claims			
Place of search	Data of completion of the search		Examiner
THE HAGUE	6 January 1995		Piriou, J-C
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